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ROHM AND HAAS COMPANY

ENGINEERING DIVISION

May 17, 1972

REC'D MAY 19 72



Wm. Ambrogi

cc: Mr. Hall Mr. Broderick
 Mr. Kenny Mr. Ewing/Mr. Myers
 Dr. Winters Mr. Geniesse/file
 Mr. Ambrogi ✓ Dr. Nemec

REPORT: S. S. Paist

FROM: Meeting with the Environmental Protection Agency
(EPA) Regarding the Disposal of Whitmoyer Arsenical
Wastes now Stored in Paulsboro, New Jersey

At 10:00 A.M. on May 12, 1972, Mr. Broderick of the law firm of Dechert, Price & Rhoads, Dr. Nemec and Messrs. Ambrogi and Paist, met with officials of the EPA's Region III in the EPA offices at 6th and Walnut Streets, Philadelphia, to discuss the disposal of about 1,000,000 gallons of arsenical wastes now stored in Paulsboro, New Jersey. Mr. Rasnic of the Water Pollution Control Division appeared to control the EPA Region III decisions in the matter and had technical and legal staff members present as well as a member of the EPA Cincinnati laboratory who had formulated the chemical/physical treatments described by Mr. Kirk, EPA Washington Counsel, in his letter of February 15, 1972, to Mr. Broderick.

In the course of the two-hour discussion, it is believed that there was general agreement about the costs, advantages and disadvantages of the chemical/physical treatment of the waste. One important area of possible disagreement centered on the concentration of the dissolved arsenical wastes remaining in the supernatant after the material was treated and the solids precipitated. Rohm and Haas believed that the minimum dissolved arsenical content of the supernatant would not be below 5 ppm with a probable concentration of 16 ppm during actual treatment under field conditions. An EPA staff member indicated he had an R. F. Weston report that indicated arsenical wastes could be treated so as to leave no more than 0.05 ppm of arsenical content in the supernatant. We indicated we would like the reference to examine in detail. (We shall also request the study directly from Mr. Weston.)

Since dilution of some liquid, either due to its arsenical or salt content, would be required for any of the chemical/physical treatments, we requested a thoughtful examination of our "visual aids" indicating a method of releasing the Paulsboro material into the sea under controlled conditions

AR100200

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that not only would protect fully the environment, but would also eliminate the potential hazard of an uncontrolled release of the stored material. We asked for a response, requesting the additional information Region III officials would require before they could make a technical judgment regarding our proposal, and discussing the technicalities on which we should base our requests for official approval for the burial of solids and the dilution of the supernatant remaining from the use of the chemical/physical treatment.

Mr. Rasnic indicated that the Director of Region III would respond in a few weeks.

The chances continue small for ocean disposal of the Paulsboro liquid without pretreatment. We shall continue to search for adequate solids disposal sites while we await a reply from the EPA.

Our best chance to obtain help from Region III is to have the technical people there see clearly that they have been "fooling around" with the technical half-solutions to effectuate an emotionally and politically satisfying conclusion in which Rohm and Haas is the only loser.

Copies of the materials left with Mr. Rasnic are attached.



S. S. Paist

SSP:bd

Attachments

AR100201

Arsenical Liquid Waste Disposal

I. Precipitate With 25% Calcium Chloride Solution At Myerstown

X A.	Transport liquid waste to Myerstown	-	-	-	-	-	\$ 42,000
	Raw material	-	-	-	-	-	18,000
	Filter solids (cost included below)	-	-	-	-	-	-
	Hold filtrate prior to 4600 - 1 dilution (cost included below)	-	-	-	-	-	-
	Wet solids to pit (55,000 cu. ft.)	-	-	-	-	-	75,000
	Processing equipment (see memo Huffman to Ambrogi 3/13/72)	-	-	-	-	-	114,000
	Labor (6 months actual processing time--4 men-5 day schedule)	-	-	-	-	-	15,000
							<u>\$ 264,000</u>
X B.	Transport waste liquor to Myerstown	-	-	-	-	-	42,000
	Precipitate with 25% CaCl ₂ solution--raw material	-	-	-	-	-	18,000
	Filter solids (costs below)	-	-	-	-	-	-
	Hold filtrate prior to 4600-1 dilution (costs below)	-	-	-	-	-	-
	Dry solids (costs below)	-	-	-	-	-	-
	Dry solids to pit (20,500 cu. ft.)	-	-	-	-	-	28,000
	Processing equipment	-	-	-	-	-	147,000
	Labor (same as A)	-	-	-	-	-	15,000
							<u>\$ 250,000</u>

Both alternatives A and B would present a questionable method of liquid disposal after solids removed. The time element of ca 3 1/2 years due to restriction of water volume availability for dilution, is unsatisfactory.

II. Precipitate With ZnCl₂ Solution At Myerstown

X C.	Transport waste liquor to Myerstown	-	-	-	-	-	42,000
	Raw material	-	-	-	-	-	13,000
	Filter solids (costs below)	-	-	-	-	-	-
	Hold filtrate prior to 2400-1 dilution (costs below)	-	-	-	-	-	-
	Wet solids to pit (70,300 cu. ft.)	-	-	-	-	-	93,000
	Processing equipment	-	-	-	-	-	114,000
	Labor (same as A)	-	-	-	-	-	15,000
							<u>\$ 277,000</u>

AR100202

Arsenical Liquid Waste Disposal

X D.	Transport waste liquors to Myerstown	-	-	-	-	\$	42,000
	Precipitate with ZnCl ₂ solution	-	-	-	-		13,000
	Filter solids (costs below)	-	-	-	-		-
	Hold filtrate prior to 2400-1 dilution (costs below)	-	-	-	-		-
	Dry solids (costs below)	-	-	-	-		-
	Dry solids to pit (25,000 cu. ft.)	-	-	-	-		35,000
	Processing equipment	-	-	-	-		147,000
	Labor (same as A)	-	-	-	-		15,000
						\$	252,000

Both alternatives C and D fall into the same category of liquid disposal after solids removal as A and B, except the time element is ca 2 years.

III. Precipitate With Ferric Sulfate - Calcium Carbonate At Myerstown

OK E.	Transport waste liquors to Myerstown	-	-	-	-		42,000
	Raw material	-	-	-	-		97,000
	Filter solids (costs below)	-	-	-	-		-
	Dilute filtrate 320-1 prior to creek disposal (costs below)	-	-	-	-		-
	Wet solids to pit (90,300 cu. ft.)	-	-	-	-		120,000
	Processing equipment	-	-	-	-		114,000
	Labor (same as A)	-	-	-	-		15,000
						\$	388,000

IV. Precipitate With Ferric Sulfate-Calcium Gluconate

OK F.	Transport waste liquors to Myerstown	-	-	-	-		42,000
	Raw material	-	-	-	-		97,000
	Filter solids (costs below)	-	-	-	-		-
	Dilute filtrate 320-1 prior to creek disposal	-	-	-	-		-
	Dry solids (costs below)	-	-	-	-		-
	Dry solids to pit (106,900 cu. ft.)	-	-	-	-		145,000
	Processing equipment	-	-	-	-		147,000
	Labor (same as A)	-	-	-	-		15,000
						\$	446,000

AR100203

Arsenical Liquid Waste Disposal

OK G.

Transport waste liquors to Myerstown	-	-	-	-	\$	42,000
Precipitate with ferric sulfate-calcium gluconate-raw material						97,000
Filter solids (costs below)	-	-	-	-	-	-
Dilute filtrate 320-1 prior to creek disposal	-	-	-	-	-	-
Drum wet solids (90,300 cu. ft.)	-	-	-	-		51,000
Processing equipment	-	-	-	-		114,000
Labor (est. for drum handling and regular processing)-	-	-	-	-		25,000
					\$	329,000

OK H.

Transport waste liquors to Myerstown	-	-	-	-		42,000
Precipitate with ferric sulfate-calcium gluconate-raw material						97,000
Filter solids (costs below)	-	-	-	-	-	-
Dilute filtrate 320-1 prior to creek disposal	-	-	-	-	-	-
Dry solids (costs below)	-	-	-	-	-	-
Drum dry solids (106,900 cu. ft.)	-	-	-	-		60,000
Processing equipment	-	-	-	-		147,000
Labor	-	-	-	-		22,000
					\$	368,000

2 years to do

Comment for alternatives G and H: What is ultimate disposition of the drums containing the solids?

- I. .Similar operation to "G" except the drummed solids are transported to ultimate storage in Pittsburgh, Pennsylvania area.

Additional transportation costs	-	-	-	-	\$	113,000
"G" Cost	-	-	-	-	=	329,000
					\$	442,000

- J. Similar operation to "H" except the drummed solids are transported to ultimate storage in Pittsburgh, Pennsylvania area.

Additional transportation costs	-	-	-	-	\$	69,000
"H" Cost	-	-	-	-	=	368,000
					\$	437,000

AR100204

Arsenical Liquid Waste Disposal

V. Spray Drying

X K.	Transportation of waste liquor to Trenton, New Jersey	-	\$	29,000
	Spray dry	- - - - -	-	243,000
	Dried solids transport to Myerstown pit (88,100 cu. ft.)	-	-	24,000
	Pit costs	- - - - -	-	<u>120,000</u>
			\$	416,000

X L.	Same as "K" except solids would be drummed and returned to Myerstown. Ultimate disposal site - - ?			
	Drum storage costs	- - - - -	\$	50,000
	"K" costs -pit	=		<u>296,000</u>
			\$	346,000

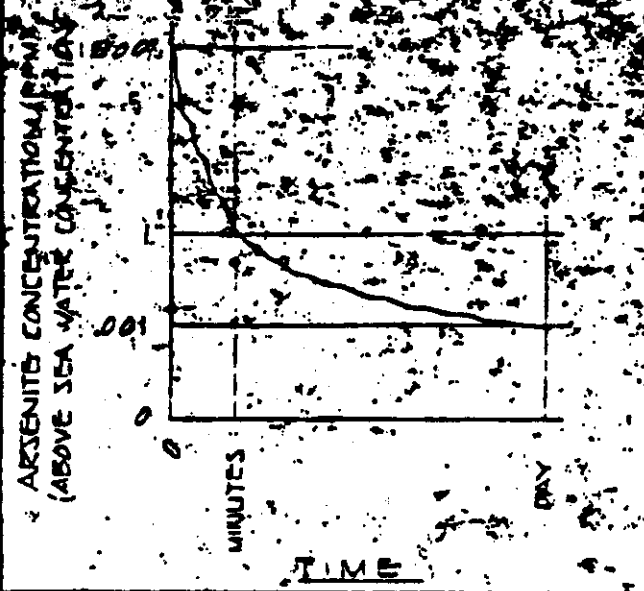
X M.	Same as "L" except drummed solids would be sent to Pittsburgh, Pennsylvania for final storage.			
	Difference between Pittsburgh and Myerstown transportation =	+ 14,000		
	"L" costs	=		<u>346,000</u>
			\$	360,000

VI. Storage

X N.	Assume continue Paulsboro, New Jersey rental and continue storage	- - - - -	\$	30,000/yea
X O.	Assumes erecting storage facilities in Myerstown, transporting the waste stream back, and just storing forever	-	\$	227,000
X P.	Assumes transporting waste liquor to Louisville, Kentucky, and store forever in an existing holding tank	- -	\$	125,000

AR100205

TOTAL TIME DISCHARGE (DAYS)	PLUMBING RATE (GPM)
12.5	100,000
15.0	83,500
150.0	41,800



AVERAGE CONCENTRATION 1 PPM (ABOVE
ARSENITE CONCENTRATION IN SEA WATER)

MIXING FROM OCEAN DISPERSED WITH OILY
WASTE FROM 2 PPM TO 100 PPM IN SEA
CONCENTRATIONS ARE IN PROPORTION TO THE
SCALE OF THE SEA WATER LOCATION OF THE
CHANGE TO BE AT LEAST 100 FEET FROM SHORE

REV	DATE	DESCRIPTION	APPROVED
REVISIONS			
<p>ONE-TIME STUDY OF ONE MILLION GALLONS OF LIQUID ARSENITE WASTE IN THE SEA</p>			
TITLE & DESCRIPTION			
<p>ROHM & HAAS</p> <p>ENGINEERING DIVISION BOSTON, PA.</p> <p>THIS DRAWING IS THE PROPERTY OF THE ROHM AND HAAS CO. AND IS LOANED TO YOU WITHOUT GUARANTEE. IT IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE ROHM AND HAAS CO. ANY VIOLATION OF THIS POLICY WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW.</p>			
DRAWN BY	DATE	CHECKED	DATE
2209.01		ART00206	
DRAWING NUMBER			

NOTE:

CONCENTRATION OF ARSENITE IN SEA WATER IS
100 TO 1,000 PPM ARSENITE AS STATED BY M.A.
POEDER AND J.L. SALASER IN "ABNORMAL
TRACE ELEMENTS IN MAN: ARSENITE" JOURNAL
OF CHRONIC DISEASES, 1965, VOL. 19, NO.
55-56. THIS RANGE IS CONFIRMED BY A NUM-
BER OF STUDIES REPORTED BY H.M. HARVEY IN
THE CHEMISTRY AND PHYSIOLOGY OF SEA WATER,
CAMBRIDGE (1967), P. 130.

THE MAXIMUM ARSENITE CONCENTRATION FOR PO-
TABLE WATER IS 0.05 PPM ARSENITE AS REPORTED
BY THE CHEMISTRY AND PHYSIOLOGY OF SEA WATER,
CAMBRIDGE (1967), P. 130.

NOT LISTED BASED ON THIS COMPONENT

10 KNOTS

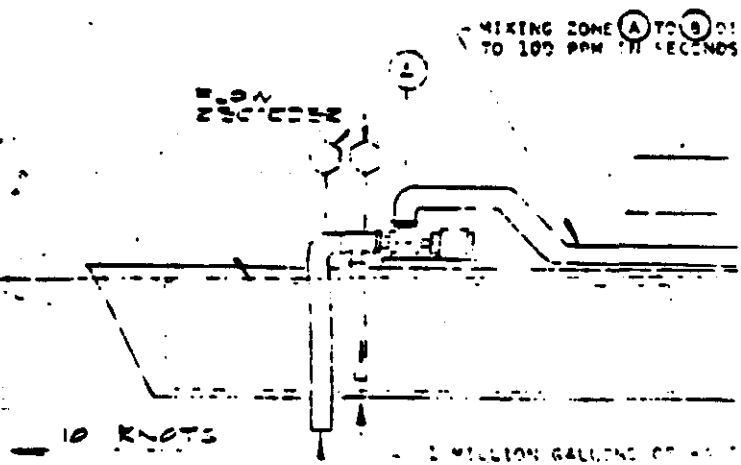
MILLION GALLONS OF WATER

1. A BILLION GALLONS OF SEA WATER WILL GO
-- INTO PUMP DURING DISCHARGE OF WASTE

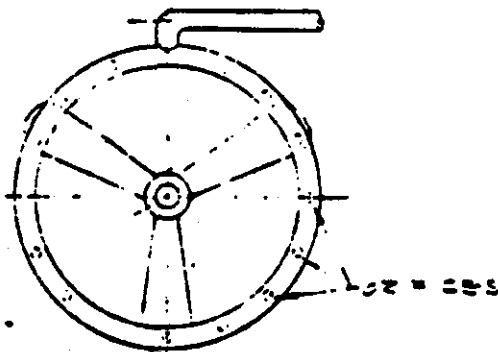
AR100207

AR100207

IN THE EVENT OF A SPILL WASTE
 QUANTITY - 1.5 MGD
 CONCENTRATIONS (CALCULATED)
 ARSENITE (AS) 1.5-1.8
 ARSENATE (AS) 1.5-1.8
 TOTAL INORGANIC ARSENIC (AS) 3.0-3.6
 TOTAL ARSENIC (AS) 3.0-3.6
 TOTAL DISSOLVED SOLIDS
 (MAINT. SALT-WATER) 21.9-21.9
 POLLUTION BASED ON THIS COMPONENT



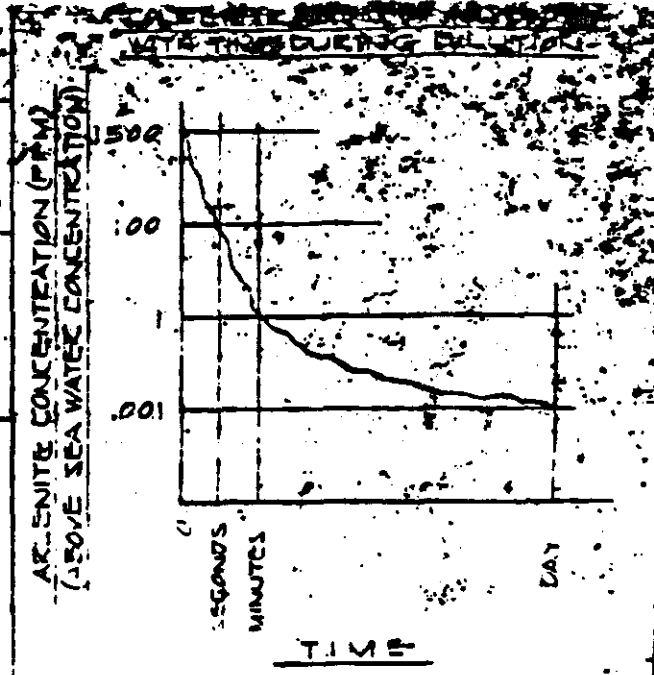
1.5 MILLION GALLONS OF SEA WATER
 INTO HULL DURING DISCHARGE OF WASTE



SECTION A-A

ARI00208

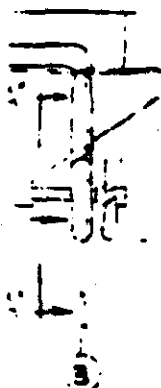
TOTAL TIME OF DISCHARGE (DAYS)	PUMPING RATE (GPM)	MINIMUM DIA. OF SHIPS PROPELLOR (FT)
1	11,700	4.5
3	3,900	6.4
7	1,700	8.4
15	750	13.5



IN 15-30 MIN

MIXING ZONE (B) TO (C) DILUTION FROM 100 PPM TO 1 PPM IN MINUTES. CONCENTRATIONS ARE IN ADDITION TO ARSENIC IN THE SEA WATER.

MIXING FROM OCEAN DISPERSION WILL DILUTE WASTE FROM 1 PPM TO .001 PPM IN A DAY. CONCENTRATIONS ARE IN ADDITION TO THE ARSENIC IN THE SEA WATER. LOCATION OF DISCHARGE TO BE AT LEAST 12 MILES FROM SHORE.



1.8 BILLION GALLONS OF SEA WATER WILL FLOW INTO PROPELLOR DURING DISCHARGE OF WASTE (DISTANCE OF VESSEL TRAVEL TIMES AREA OF PROPELLOR)

NOTES:

CONCENTRATION OF ARSENIC IN SEA WATER IS .02 TO .005 PPM ARSENIC AS STATED BY H.A. SCHROEDER AND J.V. BALASSA IN "ABNORMAL TRACE ELEMENTS IN MAN: ARSENIC", JOURNAL OF CHRONIC DISEASES, 1966, VOL. 19, PP. 95-100. THIS RANGE IS CONFIRMED BY A NUMBER OF STUDIES REPORTED BY M.N. HARVEY IN THE CHEMISTRY AND FERTILITY OF SEA WATER, CAMBRIDGE (1966), P. 119.

THE MAXIMUM ALLOWABLE CONCENTRATION FOR POTABLE WATER IN VARIOUS COUNTRIES RANGES FROM 10 TO 150 PPM ARSENIC AS REPORTED IN THE SCHROEDER AND BALASSA PAPER CITED ABOVE.

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			
<p>A ONE-TIME DILUTION OF ONE MILLION GALLONS OF TOXIC ARSENIC WASTE IN THE SEA</p>			
TITLE & DESCRIPTION			
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AS	2205.01	SCALE	
JOB NUMBER		ART00209	
DRAWING NUMBER			

AR100209

STATION	PLANT	CHARGE	TRAYS	RATE (GPM)	PERCENT (%)
1	1	1	1	695	4.5
2	2	2	2	232	3.6
3	3	3	3	100	5.4
4	4	4	4	46	3.75

ARSENITE CONCENTRATION (PPM)
(ABOVE SEA WATER CONCENTRATION)



MINIMUM TIME (A) TO (C) DILUTION FROM 1000 PPM
TO 1 PPM IN 10 SECONDS


MINIMUM TIME (B) TO (C) DILUTION FROM
1 PPM TO 0.001 PPM IN 10 MINUTES
CONCENTRATIONS ARE IN ADDITION TO THE
ARSENITE IN THE SEA WATER.

WASTE FROM OCEAN DISPERSION WILL DILUTE
FASTER FROM 1 PPM TO 0.001 PPM IN A DAY.
CONCENTRATIONS ARE IN ADDITION TO THE AR-
SENITE IN THE SEA WATER. LOCATION OF DIS-
CHARGE IS AT LEAST 175 MILES FROM SHORE.

1 GALLON OF SEA WATER WILL
PROTECT A DURING DISCHARGE
DISTANCE OF VESSEL TRAVEL
OR DILUTION

NOTE:
CONCENTRATION OF ARSENITE IN SEA WATER IS
100 TO 1000 PPM ARSENITE AS STATED BY H.A.
HEDGECOCK AND J.C. PALASSA IN "HARBOURAL
TRACE ELEMENTS IN MARINE ARSENITE", JOURNAL
OF CHEMICAL PHYSICS, 1977, VOL. 5, P. 10.
THIS RANGE IS COVERED BY A NUM-
BER OF STUDIES REPORTED BY F.M. HARVEY IN
"CHEMISTRY AND TOXICITY OF SEA WATER",
CAMBRIDGE (1977), P. 130.

THE MAXIMUM ALLOWABLE CONCENTRATION FOR OF-
TABLE WASTES IN VARIOUS COUNTRIES RANGES
FROM 100 TO 1000 PPM ARSENITE AS REPORTED
BY THE SCANDINAVIAN AND PALASSA RESEARCH
AND

REV	DATE	DESCRIPTION	APPROVED
REVISIONS			
A ONE-TIME DILUTION OF ONE MILLION GALLONS OF LIQUID ARSENIC WASTE IN THE SEA			
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APR 2209.01		SCALE	
JOB NUMBER			
DRAWING NUMBER			

AR100210

MOBILE ARSENIC WASTE

QUANTITY - 1,000,000 GALLONS

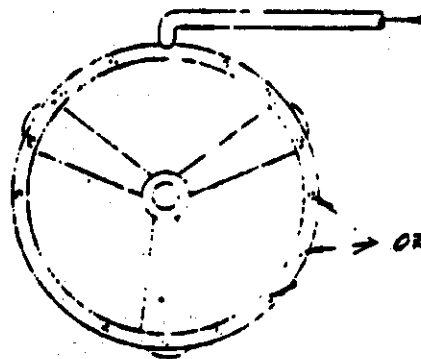
CONCENTRATION IN GALLONS/GAL

ARSENATES (AS)	1.2-1.36
ARSENATES (AS)	1.2-1.36
TOTAL INORGANIC ARSENIC (AS)	1.2-1.36
TOTAL ARSENIC (AS)	1.2-1.36
TOTAL DISSOLVED SOLIDS	1.2-1.36
(MAJORITY SALT-WATER)	1.2-1.36

CONCENTRATION BASED ON THIS CONCENTRATION

LOW RESISTANCE

10 KNOTS

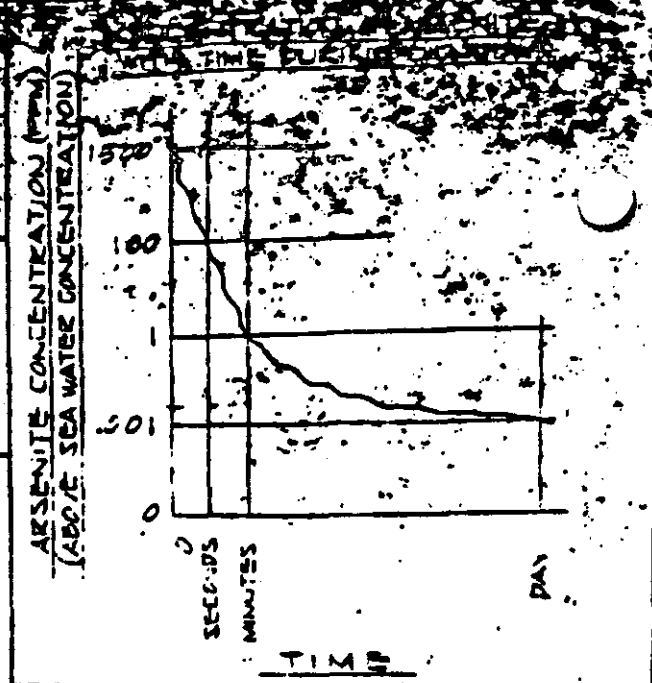


ORIFICES

SECTION A-A

AR100211

DISCHARGE DAYS	DUMPING RATE (GPM)	MAXIMUM DIA. OF SHIPS PROPELLOR (FT.)
1	635	14.5
3	732	8.4
7	100	5.4
15	46	3.75



MIXING ZONE (A) TO (B) DILUTION FROM 1500 PPM
TO 100 PPM IN 10 SECONDS

MIXING ZONE (B) TO (C) DILUTION FROM
100 PPM TO 1 PPM IN MINUTES.
CONCENTRATIONS ARE IN ADDITION TO
ARSENIC IN THE SEA WATER.


MIXING FROM OCEAN DISPERSION WITH OFFSHORE
WASTE FROM 1 PPM TO .001 PPM IN 2 DAYS.
CONCENTRATIONS ARE IN ADDITION TO THE AR-
SENIC IN THE SEA WATER. LOCATION OF DIS-
CHARGE TO BE AT LEAST 125 MILES FROM SHORE.

BILLION GALLONS OF SEA WATER WILL
INTO PROPELLOR DURING DISCHARGE
WASTE (DISTANCE OF VESSEL TRAVEL
1 AREA OF PROPELLOR)

NOTE:

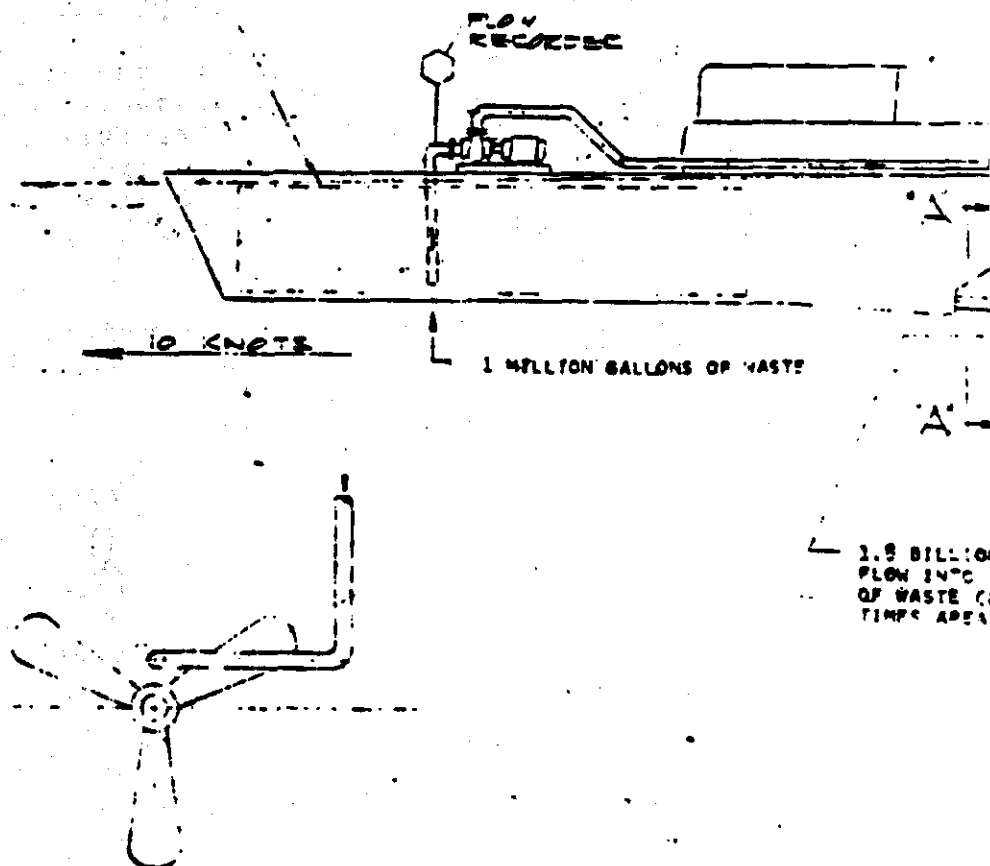
CONCENTRATION OF ARSENITE IN SEA WATER IS
.002 TO .005 PPM ARSENIC AS STATED BY H.A.
SCHROEDER AND J.J. SALASSA IN "ABNORMAL
TRACE ELEMENTS IN MAN: ARSENIC", JOURNAL
OF CHRONIC DISEASES, 1966, VOL. 19, PP.
25-106. THIS RANGE IS CONFIRMED BY A NUM-
BER OF STUDIES REPORTED BY H.B. HARVEY IN
THE CHEMISTRY AND PHYSICS OF SEA WATER,
CAMBRIDGE (1966), P. 213.

THE MAXIMUM ALLOWABLE CONCENTRATION FOR
TAKEN WATER IN VARIOUS CONCENTRATIONS RANGES
FROM .050 TO .150 PPM ARSENIC AS REPORTED
IN THE SCHROEDER AND SALASSA PAPER CITED
ABOVE.

REV	DATE	DESCRIPTION	APPROVED
REVISIONS			
A ONE-TIME DILUTION OF ONE MILLION GALLONS OF LIQUID ARSENIC WASTE IN THE SEA			
TITLE & DESCRIPTION			
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DRAWING NUMBER			

ART100212

FLUORIDE WASTE
 QUANTITY 1000 GALLONS
 CONCENTRATION IN GALLONS PER GALLON
 ARSENATE CAS 1.5
 ARSENATE CAS 1.5
 TOTAL INORGANIC ARSENIC CAS 1.5
 TOTAL ARSENATE CAS 1.5
 TOTAL DISSOLVED SOLIDS 1.5
 CHROMIUM-SALT-ACID 1.5
 REDUCTION BASED ON THIS COMPONENT



SECTION 'A-A'

AR100213